



## CHILDHOOD AUTISM RISKS FROM GENETICS AND THE ENVIRONMENT

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Update March 2011

To date, nearly 1,500 children and their families have participated in the CHARGE study. With a large number of participants, our research team can investigate some of the many different relationships that might occur between genes and environment, and lead to developmental disabilities.



### **CHARGE Science Update: Air Pollution**

Concern over exposures that come from living near freeways led the CHARGE study to team up with scientists from the University of Southern California who have been looking at traffic exposures for years. Dr. Heather Volk and her colleagues mapped the residences where CHARGE participants lived around the time of the birth of their participating child. Then the distance from that residence to the nearest freeway was determined using ‘geographic information system’ (GIS) software. Finally, we compared the CHARGE households for children with autism to those for children with typical development. The children with autism were

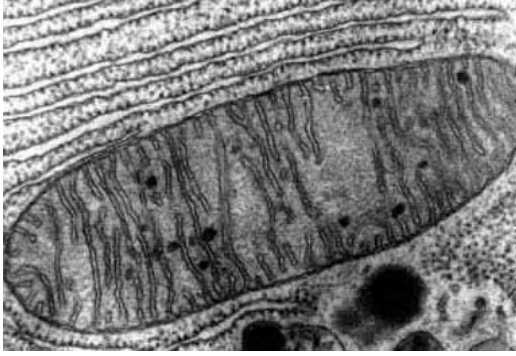
more likely to have lived close to a freeway, specifically, within a quarter mile, when they were born. If they were further than ¼ mile, there was no difference between the groups.

Other studies have shown that the pollutants that are emitted from the exhaust pipe of motor vehicles are highest very close to freeways and taper off to a general background level by ¼ mile or more. This leads us to believe that some component chemicals in the air pollution might be contributing to the risk for autism. Other factors could also have played a role, which is why in this study we adjusted for the mother’s education. Still, we will be conducting further research to understand what might be causing the higher risk for autism, and also to see if there are genes that put some children at higher risk when they breathe dirtier air, or come in contact with harmful exposures at home.

### **CHARGE Science Update: Mitochondria**

Mitochondria are components of cells. Their most important role is to convert energy from food into the energy cells use to do their work, which is why they are often referred to as the “power plant” of the cell. Cells that require large amounts of energy, such as brain and other central nervous system cells, may be especially sensitive to the effects of mitochondrial dysfunction.

Mitochondrial dysfunction can be the result of genetics, environment, or a combination of both.



Dr. Cecilia Giulivi, Professor of Biochemistry in the Department of Molecular Biosciences at UC Davis, studies the role of mitochondrial dysfunction in Huntington’s disease, and Fragile X. Recently, she joined in collaboration with CHARGE study Principal Investigator, Dr. Irva Hertz-Picciotto to study the role of mitochondrial dysfunction in autism.

Using cells collected from blood samples donated by a small group of CHARGE study children, Dr. Giulivi’s laboratory studied both mitochondrial DNA and mitochondrial function, to see if there were differences between children with and without autism. The results of Dr. Giulivi’s study, published in the *Journal of the American Medical Association (JAMA)*, showed that children in the autism group had signs of lower mitochondrial activity. Lower mitochondrial activity means less energy for cellular functioning.

The researchers also found differences in the cellular levels of a naturally occurring chemical called hydrogen peroxide, which is produced during normal mitochondrial activity. Although hydrogen peroxide can cause damage to the cell’s structure and DNA, at certain levels, the cell can readily detoxify and repair the damage. When levels of hydrogen peroxide are out of balance, cells lose the ability to repair the damage and a condition called “oxidative stress” occurs. Mitochondria

respond to oxidative stress by producing extra copies of their own DNA to compensate. Dr. Giulivi’s team found that children with autism had twice the levels of hydrogen peroxide as typically developing children, and the autism group also had higher copy numbers of mitochondrial DNA. These two findings in combination point to oxidative stress in the children with autism.

While Dr. Giulivi’s study shows that children with autism may be more likely to have mitochondrial dysfunction than their typically developing peers, it is not clear whether the dysfunction is a cause of autism, or an effect of the disorder. (See page 4 for a list of recent CHARGE study publications.)

### **Cat Companions for Children with Special Needs**

The CHARGE study is teaming up with researchers in the school of veterinary medicine at UC Davis to explore the role of cats as companion animals for children with autism and other special needs.

Almost every week, we see reported studies of the effects of dogs for motivating children to learn, and the comforting companionship dogs provide to children. Yet, cats actually are more numerous as pets in households than dogs, and very little is known about the role of cats in children’s lives. We are hoping that eligible CHARGE families will help us learn about the special relationship of cats and children by participating in a brief telephone survey. (See page 5 for details.)

### **Outreach and Education Update**

On October 10, the CHARGE team joined the effort to raise autism awareness and funds for autism research at the annual Autism Speaks *Walk Now* event in Sacramento. This year’s event, held at Raley Field, raised nearly \$250,000 for Autism Speaks. The team, along with staff from other MIND Institute studies,

hosted a booth at the resource fair, offering fun activities for children and information for parents.



### Study Investigator on national TV

On February 17, the *Dr. Oz Show* featured a panel of experts to discuss the increase in incidence and the possible causes of autism. CHARGE study Principal Investigator, Dr. Irva Hertz-Picciotto was one of the invited panel members. The show featured an audience of parents, half of whom had at least one child with autism. A video of the program is available on the show's website at: <http://www.doctoroz.com>.

### Results from the CHARGE Exit Survey

Over 100 participants have sent in an exit survey giving us feed-back about their experience in the study and sharing their reasons for choosing to participate.

Most respondents indicated that a major reason for their participation was being able to contribute to a better understanding of the causes of autism and developmental disabilities. Another major reason given was a desire to do something for families that have a child with autism or developmental disabilities. Some parents were also motivated to participate by the opportunity to have their child evaluated by one of our clinicians.

Feedback about the study experience has been valuable information for our team. Our goal is to ensure

the best possible experience for children and their family members. Overall, the feedback has been overwhelmingly positive. Here is a summary:

- 98% of respondents were either satisfied or very satisfied with their experience (the remaining 2% were neutral and 0% were dissatisfied)
- 96% found the experience worthwhile for them personally
- 94% believe their family's participation in the study will benefit society

A significant number of participants (about 30%) reported that the effort involved in participation was more than they expected. The amount of time involved in participation varies from family to family, so an exact estimate is difficult. However, clinic staff members are working hard to ensure that parents start out having the best estimate of the amount of time required to complete all study activities.

We have also shortened the time it takes to complete the telephone interview. Many parents commented that the interview was too long. To address this problem, some of the interview questions have now been put in a written form, so parents can complete them at their own pace. Parents who are more comfortable answering questions over the phone with the interviewer still have that option.



### **Recent CHARGE Study Publications (selected)**

1. Polybrominated diphenyl ethers in relation to autism and developmental delay: a case-control study (Environ Health. 2011 Jan 5;10(1):1)
2. Residential Proximity to Freeways and Autism in the CHARGE study (Environ Health Perspect. 2010 Dec 13)
3. Autoantibodies to cerebellum in children with autism associate with behavior (Brain Behav Immun. 2011 Mar;25(3):514-23.)
4. Associations of impaired behaviors with elevated plasma chemokines in autism spectrum disorders (J Neuroimmunol. 2010 Nov 20.)
5. Altered T cell responses in children with autism. (Brain Behav Immun. 2010 Sep 15)
6. Elevated plasma cytokines in autism spectrum disorders provide evidence of immune dysfunction and are associated with impaired behavioral outcome (Brain Behav Immun. 2011 Jan;25(1):40-5)

### **Acknowledgements**

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If you have questions about any of the material in this newsletter, or would like to request more information; please contact CHARGE Study Project Manager, Melissa Rose (916) 703-0219 or email [mbrose@ucdavis.edu](mailto:mbrose@ucdavis.edu)

**Thank you for being in CHARGE!**



**UC DAVIS**  
**VETERINARY MEDICINE**  
**Got a cat at home?**

**Volunteers needed for a cat- companionship survey**



Studies have shown that pet cats may be very supportive and therapeutic for children with autism and other disabilities. Researchers would like to identify the special qualities in cats that make them a good option for animal companions to children, including those with special needs, and also which children are likely to be the most responsive to their pet cats. Families of children with typical development, autism, or developmental delays, are invited to participate. This brief survey is being conducted by a research team led by Dr. Leslie Lyons from the UC Davis School of Veterinary Medicine in collaboration with the CHARGE study.

**Who can participate?**

- Families with a child that is **5- 12 years** old
- You must have at least one pet cat
- Your family participated in the UC Davis CHARGE or CHARGE-Back study

**What will participants be asked to do?**

- Participate in one or two 10-20 minute phone surveys that will ask about your cat(s) and your family's interactions with your pet cat(s)
- Phone appointments can be scheduled at your convenience
- **Families will be asked to consent to the release of the CHARGE diagnosis of their children who have participated in the CHARGE or CHARGE- Back study**
- No risk or benefit is expected for the participants or the kitties!
- No compensation will be available
- We will only ask questions about your cat, no harm to kitty!

**If you are interested and would like an information packet, or have questions, please send your contact information to:**

Lynette Hart, PhD [lahart@ucdavis.edu](mailto:lahart@ucdavis.edu) 530 752-2181

Questions can also be directed to the Principal Investigator  
Leslie Lyons, PhD (530) 754- 5546 [lalyons@ucdavis.edu](mailto:lalyons@ucdavis.edu)

